# **OXIDATION OF METALS—Volume 16, 1981**

A journal which provides a single forum for scientific contributions dealing with all aspects of gas-solid reactions. It includes results of experimental and theoretical work; review papers will be published occasionally.

#### Editor

#### D. L. Douglass

Materials Department University of California at Los Angeles Los Angeles, California

#### Associate Editors

J. B. Wagner, Jr.

Center for Solid State Science Arizona State University Tempe, Arizona

#### International Advisory Board

J. Bénard

Université de Paris Paris, France

C. E. Birchenall University of Delaware

Newark, Delaware

J. V. Cathcart
Oak Ridge National Laboratory

Oak Ridge, Tennessee M. J. Graham

National Research Council of Canada Ottawa, Ontario, Canada

D. R. Holmes

Central Electricity Research Laboratories Leatherhead, Surrey, England

P. Kofstad

University of Oslo, Oslo, Norway

S. Mrowec

Institute of Materials Science School of Mining and Metallurgy Krakow, Poland

K. Nishida

Hokkaido University Sapporo, Japan

F. S. Pettit

Pratt & Whitney Aircraft Middletown, Connecticut G. C. Wood

Corrosion and Protection Centre University of Manchester Institute of Science and Technology Manchester, England

A. Rahmel

Frankfurt am Main, West Germany

R. A. Rapp

Ohio State University Columbus, Ohio

J. Sheasby

University of Western Ontario London, Ontario, Canada

W. W. Smeltzer

McMaster University Hamilton, Ontario, Canada

J. Stringer

Electric Power Research Institute Palo Alto, California

D. P. Whittle

University of California Berkeley, California

W. L. Worrell

University of Pennsylvania Philadelphia, Pennsylvania

G. J. Yurek

Massachusetts Institute of Technology Cambridge, Massachusetts

Published bimonthly at Winterstoke Road, Bristol 3, England, by Plenum Publishing Corporation, 227 West 17th Street, New York, N.Y. 10011. In 1981, Volumes 15 and 16 (6 issues each) will be published. Subscription orders should be addressed to the publisher. Oxidation of Metals is abstracted or indexed in Chemical Abstracts, Chemical Titles, Corrosion, Abstracts, Current Contents, Energy Research Abstracts, Engineering Index, Metals Abstracts Index, Referativnyi Zhurnal, Science Citation Index, and Solid State Abstracts Journal. © 1981 Plenum Publishing Corporation. Oxidation of Metals participates in the program of Copyright Clearance Center, Inc. The appearance of a code line at the bottom of the first page of an article in this journal indicates the copyright owners consent that copies of the article may be made for personal or internal use. However, this consent is given on the condition that the copier pay the stated per-copy fee through the Copyright Clearance Center, Inc. for all copying not explicitly permitted by Sections 107 or 108 of the U.S. Copyright Law. It does not extend to other kinds of copying, such as copying for general distribution, for advertising or promotional purposes, for creating new collective works, or for resale, nor to the reprinting of figures, tables, and text excerpts.

Subscription rates:

Volumes 15 and 16, 1981 (6 issues each) \$145.00 (outside the U.S., \$162.50).

Volumes 17 and 18, 1982 (6 issues each) \$160.00 (outside the U.S., \$179.00).

Second-class postage paid at Jamaica, N.Y. 11431.

Printed in Great Britain.

Oxidation of Metals is published bimonthly at Winterstoke Road, Bristol BS3 2NT, England, by Plenum Publishing Corporation, 233 Spring Street, New York, N.Y. 10013. In 1982, Volumes 17 and 18 (6 issues each) will be published. Subscription orders should be addressed to the publisher. Oxidation of Metals is abstracted or indexed in Chemical Abstracts, Chemical Titles, Corrosion Abstracts, Current Contents, Energy Research Abstracts, Engineering Index, Metals Abstracts Index, Referativnyi Zhurnal, Science Citation Index, and Solid State Abstracts Journal. @ 1982 Plenum Publishing Corporation. Oxidation of Metals participates in the program of Copyright Clearance Center, Inc. The appearance of a code line at the bottom of the first page of an article in this journal indicates the copyright owner's consent that copies of the article may be made for personal or internal use. However, this consent is given on the condition that the copier pay the stated per-copy fee through the Copyright Clearance Center. Inc. for all copying not explicitly permitted by Sections 107 or 108 of the U.S. Copyright Law. It does not extend to other kinds of copying, such as copying for general distribution, for advertising or promotional purposes, for creating new collective works, or for resale, nor to the reprinting of figures, tables and text excernts.

CONTENTS	
Morphologies of Uniform Adherent Scales on Binary Alloys	1
B. D. Bastow, G. C. Wood, and D. P. Whittle	
The Corrosion of Some Superalloys in Contact with Coal Chars in Coal Gasifier Atmospheres	29
D. L. Douglass, V. S. Bhide, and E. Vineberg	
The Parabolic Growth of Oxide Solid Solutions on Binary Alloys:  A Semiempirical Approach	81
D. P. Whittle, F. Gesmundo, and F. Viani	
The Oxidation Mechanism of Fe-Ni-Co Alloys	99
I. E. Klein, A. E. Yaniv, and J. Sharon	
The Initial Oxidation of Iron at 200° and 300°C and the Effect of Surface Sulfur	107
T. J. Driscoll	
The Application of Thermodynamics to the Oxidation Behavior of Mild Steels in Carbon Dioxide-Based Atmospheres	133
M. F. Taylor	
On the Influence of Metal Lattice Diffusion on Oxidation of Metals and Alloys	147
G. B. Gibbs	
The Formation of Solid Solution Oxides During Internal Oxidation	159
D. P. Whittle, F. Gesmundo, B. D. Bastow, and G. C. Wood	
The Scaling of a Fe-20Cr Alloy in H <sub>2</sub> -H <sub>2</sub> O-H <sub>2</sub> S Mixtures	175

W. F. Chu and A. Rahmel

## CONTENTS

A. Die Die Orides on Duro	
Quasi-Steady-State Growth of Layered Two-Phase Oxides on Pure  Metals  A. T. Frankeld, Ir. and Naria Sata	203
A. T. Fromhold, Jr. and Norio Sato	
Corrosion in SO <sub>2</sub> of Pure and Preoxidized Copper at High Temperature	221
Chedly Toumi and Bernard Gillot	
Prediction of the Global Volatilization Rate of Gas-Metal-Alloy Reaction Systems—Method of Calculation	243
Tai-Kang Liu and Renato G. Bautista	
The High-Temperature Corrosion of Alloy 800 in Carburizing, Oxidizing, and Sulfidizing Environments D. S. Williams, R. Möller, and H. J. Grabke	253
Sulfidation of Manganese in H <sub>2</sub> S-H <sub>2</sub> Atmospheres at Temperatures	
Between 1073 and 1273 K	267
F. A. Elrefaie and W. W. Smeltzer	
The Scaling Behavior of a Monophase Cu-3.36 wt.% Co Alloy At 700-1000°C	277
F. Gesmundo and F. Viani	
The Morphology of Oxidation of Alumina-Forming Iron-Base Chromium and Silicon	295
R. G. Miner and V. Nagarajan	
The Morphology of Oxidation of Alumina-Forming Iron-Base Alloys Containing Chromium and Aluminum R. G. Miner and V. Nagarajan	313
The Oxidation of a Stainless Steel with Limited Quantities of Sea Salt	327
H. E. Evans, D. A. Hilton, R. A. Holm, and P. W. G. Simpson	

### **OXIDATION OF METALS**

Vol. 16, Nos. 5/6 December 1981 CONTENTS Oxidation of Fe-C Alloys in the Temperature Range 600-850°C 339 A. U. Malik and D. P. Whittle The Oxidation of Cobalt in Air From Room Temperature to 467°C 355 H. G. Tompkins and J. A. Augis Observations on the Effect of Low Sulfur Activity on the Oxidation of Chromium-Depleted Zones in a Stainless Steel 371 R. C. Lobb and H. E. Evans A Mathematical Model for Internal Oxidation 385 K. M. Vedula, A. W. Funkenbusch, and R. W. Heckel An Infrared and Raman Spectroscopy Study of the Corrosion 399 Products on Carbon Steel and Weathering Steel P. Fabis, C. Brown, T. Rockett, and R. Heidersbach The Early Stages of Oxidation of Ion-Implanted Nickel at High 409 Temperature Zhou Peide, F. H. Stott, R. P. M. Procter, and W. A. Grant

Author Index to Volume 16

Subject Index to Volume 16

427

429

